REMARKS

Rejection under 35 U.S.C. §103(a)

Claims 25-50 are rejected under 35 U.S.C. §103(a) as being unpatentable over Harrison et al. (6,358,892) or Harrison et al. (5,853,434), which rejection is respectfully traversed on the grounds asserted below.

> The Harrison et al. ["Harrison"] references disclose compositions comprising polyalkylene polysuccinimides, and post-treated derivatives thereof, which act as dispersants in lubricating oils and as deposit inhibitors in hydrocarbon fuels. The polyalkylene compositions can be prepared by reacting a mixture of an alkenyl or alkylsuccinic acid derivative, an unsaturated acidic reagent copolymer, and a polyamine under reactive conditions. See formula (1) set forth in column 6, lines 15-42, of ('892) and column 4, lines 8-30 of ('434). The alkenyl or alkyl substituent R, of the alkenyl or alkylsuccinic acid derivative has a MN of from 1800 to 3000. The unsaturated acidic reagent copolymer has an average degree of polymerization, x, of from 2 to 20, and is a copolymer of an unsaturated acidic reagent and an olefin wherein R' is an alkyl having an average of from 12 to 28 carbon atoms. The polyamine has at least three nitrogen atoms and has from 4 to 20 carbon atoms. The examiner is of the position that the polyalkylene polysuccinimides set forth in the Harrison references appear to meet the limitations of the polymers in applicants' independent claim 26 and the process for preparing the polymers in independent claims 35 and 37. The only differences appear to be substituent R_1 which is methyl in applicants' claims and hydrogen in Harrison. The examiner is of the position that this is an obvious variance which is not expected to effect the properties of the polysuccinimides compound. Harrison teaches that the polysuccinimides compound may be post-treated by reaction with a cyclic carbonate, a boron compound such as boric acid, and other compounds inorganic phosphorous acids. See column 13, line 40 to column 16, lines 35 of ('892). Thus, the examiner is of the position that the Harrison references meet the limitations of the above rejected claims.

The Examiner is of the position that Harrison et al. (6,358,892) and Harrison et al. (5,853,434) references meet the limitation of Claims 25-50 in the present

application. The Examiner's position is based on the difference between the R_1, which is methyl in applicant's claims and hydrogen in Harrison and this is an obvious variance which is not expected to affect the properties of the polysuccinimides compound.

The important difference between the Harrison references and the present invention lies in the composition of the copolymer used to make the polymeric succinimides. The polymeric succinimides in the Harrison references are made from polyisobutenyl succinic anhydride, a copolymer of an *alpha olefin* and maleic anhydride, and an amine. See column 11, lines 42-47 (5,853,434) and column 11, lines 35-47 (6,358,892). In contrast, Applicants' polymeric succinimides are made from polyisobutenyl succinic anhydride, *low molecular weight polyisobutene* and maleic anhydride (PIB/UAR copolymer) and an amine. See page 13, lines 30-32; page 14, lines 13-16 and page 16, lines 10-20 in the present application.

The polymeric succinimides in the Harrison references are made using a copolymer made from alpha olefins and maleic anhydride. Such copolymers are typically glassy solids which cannot be handled easily or pumped readily at ambient temperatures. When using such copolymers, one resort to costly procedures of either heating the copolymer above its melting point or adding a solvent which must be later removed and disposed of in compliance with environmental regulations.

Replacing the alpha olefin with the low molecular weight polyisobutene in the copolymer used to make the polymeric succinimides of the present invention gave unexpected improvement over the alpha olefin copolymers in the following respects. Surprisingly, a chain transfer agent is not required to prepare the PIB/UAR copolymer at the desired low molecular weight. Furthermore, since the PIB/UAR copolymer is liquid, it is not necessary to dissolve the PIB/UAR copolymer by using additional heat or adding water. See page 2, lines 14-30 of

the present patent application. It is this change in the preparation of the copolymers that is at the heart of the present invention. This result was neither foreseen nor predictable based on the Harrison references since they neither teach nor suggest the use of the low molecular weight polyisobutene for making the copolymer of the present invention.

Claims 1-25 are rejected under 35 U.S.C. §103(a) as being unpatentable over Ruhe Jr. et al. (5,175,225), which rejection is respectfully traversed on the grounds asserted below.

> Ruhe, Jr. discloses oligomeric copolymers having alternating succinic and polyalkylene groups which may be used as intermediates for dispersants themselves in lubricating oil compositions. Ruhe, Jr. also discloses a process for preparing the oligomeric copolymers. The copolymers are set forth in column 6, lines 45-53, wherein W' and Z' are independently selected from -OH, -OH-lower alkyl or taken together are –O- to form a succinic anhydride group, and the R substituents may be hydrogen, lower alkyl groups of 1 to 6 carbon atoms, and higher alkyl groups of at least 30 carbon atoms. The examiner is of the position that the oligomeric copolymer of Ruhe, Jr. meet the limitations of the copolymers of independent claims 1 and 14 when n is 1 and m is 1.

The Ruhe, Jr. et al. reference is directed to a process for preparing a copolymer of maleic anhydride and a high molecular weight olefin, having 32 carbon atoms or more. See column 2, lines 55-59 and column 4, lines 55-63. In contrast, the present invention is directed to preparing a copolymer of maleic anhydride and a low molecular weight polyisobutene. The polyisobutene of the present invention is defined as having less than 32 carbon atoms, preferably less than 28 carbon atoms. See page 5, lines 12-15 and page 16, lines 10-20 in the application for the present invention.

The major difference between the preparation of the oligomeric copolymer in Ruhe, Jr. et al. and the preparation of the copolymers of the present invention is that in Ruhe, Jr. et al. the copolymers are prepared using high molecular weight

olefins which provide copolymers such that the resulting composition is soluble in and compatible with mineral oils, fuels and the like. See column 8, lines 12-21. The preferred polyisobutenes have an average molecular weight of about 500 to about 5,000. See column 8, lines 55-59. In contrast, in the present invention, the copolymers are prepared using low molecular weight polyisobutene, molecular weight of about 448 or less. See page 16, lines 18-20.

The above discussed difference in the preparation of the copolymers unexpectedly resulted in an improvement over prior art process. The improved process did not require a chain transfer agent to make the copolymer. In addition, since the copolymer was liquid at ambient temperature, there was no need to heat it or to add solvent. This further eliminated the need to remove the solvent at a later stage, thus avoiding additional expense. See page 21, lines 13 and 14. There is no suggestion in Ruhe, Jr. et al. that replacing the high molecular weight olefins with the low molecular weight polyisobutenes of the present invention for making the copolymers would result in an improved process as observed by the applicants.

The use of the low molecular weight polyisobutene for making the copolymers of the present invention is not disclosed in Ruhe, Jr. et al. A reading of Ruhe, Jr. et al. would not lead one skilled in the art to make this change in the process since Ruhe, Jr. et al. only discloses and teaches the use of the high molecular weight olefins.

Conclusion

The present invention is clearly non-obvious over the Harrison et al. references and the Ruhe, Jr. reference because these references neither disclose nor suggest the use of the polyisobutene for making copolymers to obtain copolymers that are liquid at ambient temperature and which may be used in further applications, such as to prepare polymeric succinimides of the present

invention, without the addition of heat or solvent. For these reasons, Applicants submit that this application is in condition for allowance and request that the Examiner reconsider this rejection and allow Claims 1-50 of this application.

Respectfully submitted,

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Enclosures

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